BEFORE THE
PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2009-3-E

In the Matter of	)	
Annual Review of Base Rates	)	**TESTIMONY OF**
for Fuel Costs for	)	**DAVID C. CULP**
Duke Energy Carolinas, LLC	)	
	)	

Q. PLEASE STATE YOUR NAME, ADDRESS AND POSITION.

A. My name is David C. Culp. My business address is 526 South Church Street, Charlotte, North Carolina. I am Manager, Nuclear Fuel Management for Duke Energy Carolinas, LLC ("Duke Energy Carolinas" or the "Company").

Q. WHAT ARE YOUR PRESENT RESPONSIBILITIES AT DUKE ENERGY CAROLINAS?

A. As manager of nuclear fuel management, I am responsible for nuclear fuel purchasing/contracting, spent nuclear fuel management, nuclear fuel mechanical & thermal hydraulic design, and the Company's activities related to the Department of Energy's mixed oxide ("MOX") fuel program.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from the University of South Carolina with a Bachelor of Science degree in Mechanical Engineering and a Master's degree in Business Administration. I began my career at Duke Energy Carolinas in 1986 as an engineer and worked in various roles including nuclear fuel assembly and control component design, fuel performance, and fuel reload engineering. I assumed the commercial responsibility for purchasing uranium, conversion services, enrichment services and fuel fabrication services in 1995. In 1999, I added spent nuclear fuel management to my responsibilities. In 2003, I was named vice president of Claiborne Energy Services – a partner in the Louisiana Energy Services venture to license, construct and operate a new uranium enrichment plant in the United States. I assumed my current role in 2005.

I have served as Chairman of the World Nuclear Fuel Market's Board of Governors, an organization that promotes efficiencies in the nuclear fuel markets. I have also served as Chairman of the Ad Hoc Utilities Group ("AHUG"), an association that promotes free trade in nuclear fuel, and Chairman of the Nuclear Energy Institute's Utility Fuel Committee, an association aimed at improving the economics and reliability of nuclear fuel supply and use.

I am a registered professional engineer in the states of North Carolina and South Carolina.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to (1) provide information regarding the Company's nuclear fuel purchasing practices, (2) provide costs for the June 2008 through May 2009 actual period, and (3) describe changes forthcoming in the October 2009 through September 2010 estimated period.

Q. YOUR TESTIMONY INCLUDES 2 EXHIBITS. WERE THESE EXHIBITS PREPARED BY YOU OR AT YOUR DIRECTION AND UNDER YOUR SUPERVISION?

A. Yes. These exhibits were prepared at my direction and under my supervision, and consist of Culp Exhibit 1 (The Nuclear Fuel Cycle), which is a graphical representation of the nuclear fuel cycle, and Culp Exhibit 2 (Nuclear Fuel Procurement Practices).

Q. PLEASE DESCRIBE THE COMPONENTS THAT MAKE UP NUCLEAR FUEL.

A. In order to prepare uranium for use in a nuclear reactor, it must be processed from an ore to a ceramic fuel pellet. This process is commonly broken into four distinct industrial stages: (1) mining and milling, (2) conversion, (3) enrichment, and (4) fabrication. This process is illustrated graphically in Culp Exhibit 1.

Uranium is usually mined by either surface (open cut) or underground mining techniques, depending on the depth of the ore deposit. The ore is then sent to a mill where it is crushed and ground-up before the uranium is extracted by leaching, the process in which either a strong acid or alkaline solution is used to dissolve the uranium. Once dried, the uranium oxide ("U_3O_8") concentrate, often referred to as "yellowcake," is packed in drums for transport to a conversion facility. Alternatively, uranium may be mined by in situ leach ("ISL"), in which oxygenated groundwater is circulated through a very porous ore body to dissolve the uranium and bring it to the surface. ISL may also use slightly acidic or alkaline solutions to keep the uranium in solution. The uranium is then recovered from the solution in a mill to produce U_3O_8.

After milling, the U_3O_8 must be chemically converted into uranium hexafluoride ("UF_6"). This intermediate stage is known as "conversion," and it produces the feedstock required in the isotopic separation process.

Naturally occurring uranium primarily consists of two isotopes, 0.7% U-235 and 99.3% U-238. Most of this country's nuclear reactors (including those of the Company) require U-235 concentrations in the 3-5% range to operate a complete cycle of 18 to 24 months between refueling outages. The process of increasing the concentration of U-235 is known as "enrichment." The two commercially available enrichment processes, gaseous diffusion and gas centrifuge, first heat the UF_6 to create a gas. Then, using the mass differences between the uranium isotopes, the natural uranium is separated into two gas streams, one being enriched to the desired level of U-235, known as low enriched uranium, and the other being depleted in U-235, known as tails.

Once the UF_6 is enriched to the desired level, it is converted to uranium dioxide ("UO_2") powder and formed into pellets. This process and subsequent steps of inserting the fuel pellets into fuel rods, bundling the rods into fuel assemblies, and the design and licensing required for use of the fuel assemblies in nuclear reactors is referred to as "fabrication." New fuel assembly orders are planned for cycle lengths of approximately eighteen months. The length of a cycle is the duration of time between when a unit starts up after refueling and when it starts up after its next refueling.

For fuel batches recently loaded into Duke Energy Carolinas' reactors, uranium concentrates have represented approximately 30% of the total direct fuel cost. Conversion services, enrichment services, and fabrication services have represented approximately 5%, 45%, and 20% of the total direct fuel cost, respectively.

Q. PLEASE PROVIDE A SUMMARY OF DUKE ENERGY CAROLINAS' NUCLEAR FUEL PROCUREMENT PRACTICES.

A. As set forth on Culp Exhibit 2, Duke Energy Carolinas' nuclear fuel procurement practices involve computing near and long-term consumption forecasts, establishing target inventory levels, projecting required annual fuel purchases, qualifying suppliers, requesting proposals, negotiating a portfolio of spot and long-term supply contracts from diverse sources of supply, assessing spot market opportunities and monitoring deliveries against contract commitments. Duke Energy Carolinas relies extensively on long-term contracts to cover the largest portion of its forward requirements in each of the four industrial stages of the nuclear fuel cycle. By staggering long-term contracts over time, the Company's purchases within a given year consist of a blend of contract prices negotiated at many different periods in the markets, which has the effect of smoothing out the Company's exposure to price volatility. Diversifying fuel suppliers reduces the Company's exposure to possible disruptions from any single source of supply.

Q. WHAT CHANGES HAVE OCCURRED IN THE COST OF THE VARIOUS STAGES OF NUCLEAR FUEL DURING THE ACTUAL PERIOD?

A. The spot market price of uranium concentrates increased to a record high of $138/lb in June 2007. Since then, the spot market price has declined more than 50%. During the actual period, the market price decreased from $60/lb in June 2008, to a three-year low of $40/lb, before increasing to $49/lb in May 2009. While these spot market prices were markedly lower than the record market high in 2007, they exceed the maximum price experienced in the spot market prior to 2006. The impact of spot uranium market prices on the Company during the actual period was mitigated by long-term supply contracts negotiated prior to 2006 when market prices were notably lower. One hundred percent of the Company's uranium purchases during the actual period were delivered under long-term contracts negotiated at lower market prices prior to the actual period. The average unit cost of the Company's purchases of uranium concentrates during the actual period was $19.48/lb, which is lower than the average unit cost of $25.65/lb for the same timeframe a year earlier, and notably less than the spot market prices in the same period.

Industry consultants expect spot market prices to remain high in comparison to historic norms as exploration, mine construction, and production gear up. Also, as the Company's current contracts expire, they will be replaced with contracts at higher market prices. These higher prices will be reflected in the future as fuel assemblies using such uranium are fabricated and loaded into the Company's reactors.

Market prices for enrichment have increased more than 100% since the market lows experienced in calendar year 2000. At the beginning of the actual period, the market price was $149/SWU and increased to $163/SWU by the end of the actual period. The impact of these higher market prices on the Company during the actual period was mitigated by the long-term supply contracts negotiated prior to the actual period at a time when market prices were lower. One hundred percent of the Company's enrichment purchases during the actual period were delivered under long-term contracts negotiated at lower market prices prior to the actual period. The average unit cost of enrichment purchased by Duke Energy Carolinas in the actual period was $107/SWU, which was an increase from $101/SWU in the prior reporting period, yet remained well below spot market prices. This increase was due to the expiration of legacy contracts that were replaced with contracts at higher market prices, a trend that will continue into the future. These higher prices will be reflected in the future as fuel assemblies using such enrichment are fabricated and loaded into the Company's reactors.

Market prices for fabrication have been reasonably stable in recent years and the Company's forward requirements are covered under existing long-term contracts through and beyond the estimated period. The cost for fabrication services purchased by the Company in the actual period was comparable to that purchased in the prior period.

Although the cost of the Company's purchases of conversion decreased slightly in the actual period as compared to the prior period, these decreased costs have a limited impact on the overall reported fuel expense rate because the cost for these purchases represents a relatively minor portion of the Company's total direct fuel cost.

Q. WHAT CHANGES DO YOU EXPECT IN THE COMPANY'S NUCLEAR FUEL COSTS IN THE ESTIMATED PERIOD?

A. Duke Energy Carolinas anticipates nuclear fuel expense will increase through the estimated period. Because fuel typically is expensed over two to three operating cycles – roughly three to five years – Duke Energy Carolinas' nuclear fuel expense through the estimated period will be largely influenced by the cost of fuel assemblies loaded into the reactors during the actual period as well as prior periods. Much of the fuel residing in the reactors during the estimated period will have been obtained under contracts negotiated prior to the market price increases in uranium and enrichment. However, newer contracts reflecting the increasing price trends will contribute a greater portion of the uranium and enrichment requirements into the future.

In addition, a reliability issue with the design of the fabricated fuel assembly recently operated at the Oconee plant has emerged which has the potential for increased worker doses and personnel contamination, making long-term reliance on the design unacceptable. Therefore, a transition to a new design with significantly improved reliability is underway. The new design is less efficient from a uranium utilization perspective and will increase fuel requirements and costs. The increased fuel requirements resulting from this transition and the aforementioned increases in the uranium and enrichment costs are the predominant drivers for the increase in nuclear fuel costs projected for the estimated period.

As a result, the average fuel expense is expected to increase from 0.46 cents per kilowatt hour ("kWh") incurred in the actual period to approximately 0.5 cents per kWh in the estimated period. As fuel with a low cost basis is discharged from the reactor and lower priced legacy contracts continue to expire, nuclear fuel expense is anticipated to experience further increases in the future.

Q. WHAT STEPS IS THE COMPANY TAKING TO PROVIDE STABILITY IN ITS NUCLEAR FUEL COSTS AND TO MITIGATE AGAINST PRICE INCREASES IN THE VARIOUS COMPONENTS OF NUCLEAR FUEL?

A. As I discussed earlier and as described in Culp Exhibit 2, Duke Energy Carolinas relies extensively on long-term contracts to cover the largest portion of its forward requirements in each of the four industrial stages of the nuclear fuel cycle. By staggering long-term contracts over time, the Company's purchases within a given year consist of a blend of contract prices negotiated at many different periods in the markets, which has the effect of smoothing out the Company's exposure to price volatility.

The effectiveness of the above strategy depends on the willingness of fuel suppliers to offer certain pricing mechanisms under long-term contracts (e.g., fixed prices, base escalated prices, or caps on market index prices). The Company found that during periods in which the uranium spot market prices were rapidly increasing, suppliers became reluctant to offer these pricing mechanisms. Instead, uranium suppliers offered contracts with delivery prices tied to future market prices with no ceiling price and very high floor prices. As a result, the Company adjusted its strategy by purchasing uranium in the spot market and holding it to meet future requirements. As uranium prices have decreased from the peak market price in 2007, suppliers are beginning to again offer reasonable pricing terms under long-term contracts. This development, in turn, has improved opportunities to obtain supplies under long-term contracts.

The Company is also working with its fuel vendors to develop alternative fuel assembly design options that offer improved uranium utilization without sacrificing reliability. These are long-term projects, however, as the typical product development time for a major fuel assembly design change can range from eight to ten years to allow for adequate design development, laboratory testing, and in-reactor verification of the design for three fuel cycles. Such improved designs would be expected to help mitigate increases in uranium and enrichment costs in future years.

Although costs of certain components of nuclear fuel are expected to increase in future years, nuclear fuel costs on a kWh basis likely will continue to be a fraction of the kWh cost of fossil fuel. Therefore, customers will continue to benefit from the Company's diverse generation mix and the strong performance of its nuclear fleet through lower fuel costs than would otherwise result absent the significant contribution of nuclear generation to meeting customers' demands.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.